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I, JANENE PEISKER, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2003907074 for a patent by ARMACEL PTY LIMITED as filed on 19 December 2003.

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JANENE PEISKER
TEAM LEADER EXAMINATION
SUPPORT AND SALES

ARMACEL PTY LTD

AUSTRALIA
Patents Act 1990

PROVISIONAL SPECIFICATION FOR THE INVENTION ENTITLED:

PLATEN FOR USE IN PRODUCT ENCAPSULATION

The invention is described in the following statement:-

The present invention relates to apparatus used in the ARMACEL (Registered Trade Mark) process. That process basically involves partially, or substantially completely, encapsulating an article with a layer, or a plurality of layers, of thermoformable plastics material. In particular the present invention relates to a platen used to support such articles during their encapsulation.

The ARMACEL process and apparatus for forming structural articles, especially from weak substrates such as polystyrene and cardboard, and articles so formed, are disclosed in the applicant's International PCT Patent Application No. PCT/AU95/00100 entitled "A method and apparatus for forming structural articles" (WO 95/23682), International PCT Patent Application No. PCT/AU96/00541 entitled "Layered Structural Article" (WO 97/09166) and International PCT Patent Application No. PCT/AU00/00250 (WO 00/59709) entitled "An improved method of forming structural articles" - the contents of all three of which are hereby incorporated into the present specification by cross reference. A further, presently unpublished specification is that of Australian Patent Application No. 2003 902 211 lodged 25 June 2003 and entitled "Method of, and Apparatus for, Forming an Article and an Article Formed thereby" which discloses the encapsulation of an interior member which is neither at least partially fluid permeable nor is perforated to become so. The disclosure of that specification is also hereby incorporated by cross-reference.

These specifications disclose forming structural articles from a shape defining interior member and at least one external skin. The basic steps of the method comprise:

1. heating a thermoformable sheet intended to form the external skin,
2. bringing the heated sheet alongside the interior member,
3. applying a fluid pressure differential between opposite surfaces of the interior member and the sheet to conform the sheet to the shape of the interior member and mutually engage same, and
4. maintaining the fluid pressure differential until the sheet has cooled.

The application of a fluid pressure differential is normally brought about by evacuation of the gas (normally air) between the heated sheet and the interior member or article. During this procedure the article sits on, and is supported by, a platen

which is connected via a valved conduit to a vacuum tank or other source of reduced air pressure. In order to achieve good results in conforming the heated sheet to the shape of the interior member or article, it is desirable for the air to be evacuated as speedily as possible. The speed at which the air can be evacuated is determined not only by the degree of vacuum, but also by the nature of the platen.

It is therefore the object of the present invention to provide an improved platen construction which assists the ARMACEL process.

In accordance with the present invention there is disclosed a platen for use in product encapsulation and like procedures where gas is to be quickly evacuated, said platen comprising:

a base plate,

at least one gas evacuation conduit each of which communicates through said base plate,

a support plate spaced from said base plate to create a plenum chamber between said base plate and support plate and with which each said gas evacuation conduit communicates,

a first array of channels formed in that surface of said support plate remote from said plenum chamber, those areas of said support plate surface intermediate said channels forming a plurality of mesas, and

a multiplicity of apertures located in said channels and each passing through said support plate to communicate said channels with said plenum chamber.

A preferred embodiment of the present invention will now be described with reference to the drawings in which;

Fig. 1 is an exploded perspective view of the platen of the preferred embodiment,

Fig. 2 is a perspective view at an enlarged scale of a portion of the support plate circled in Fig. 1,

Fig. 3 is a transverse cross sectional view through the assembled platen, and

Fig. 4 is an enlarged view of a portion of the platen as illustrated in Fig. 3.

As seen in the drawings and, Fig. 1 in particular, it will be seen that the platen 1 is assembled from a stack of essentially co-planar plates or sheets. The lowermost of these is a base plate 2, next comes a support plate 3 which in turn supports a fine wire mesh 4 which in turn supports a perforated plate 5.

As best seen in Figs. 1 and 3, the support plate 3 is spaced from the base plate 2 by means of a regular array of spaced apart cylindrical spacers 7, with the volume created between the base plate 2 and support plate 3 constituting a plenum chamber 9 which is sealed by inter-engagement of the peripheries of the plates 2 and 3. A plural number, preferably 3 or 4, of conduits 11 communicate through the base plate 2 and into the plenum chamber 9. Each of the conduits 11 has a valve 12 by means of which the plenum chamber 9 can be connected to a vacuum tank or tanks (not illustrated) to which the conduits 11 are connected.

As indicated on the left hand side of Fig. 3, some or all of the conduits 11 can pass through the base plate 2. Alternatively, as indicated on the right hand side of Fig. 3 the conduit 11 can terminate in a flange which overlies, and seals a through hole in the base plate 2.

As best appreciated from Fig. 1, the upper surface of the support plate 3 is divided by means of a regular closely spaced rectangular array of channels 14 into a plurality of mesas 15. As best seen in Fig. 2, the top of each mesa 15 is in turn provided with a regular closely spaced rectangular array of grooves 17 which lead into the channels 14. At each intersection of the channels 14 is located a corresponding through aperture 19 which passes through the support plate 3 and thus connects the channels 14 with the plenum chamber 9. The upper and lower ends of each aperture 19 are preferably radiused or chamfered as indicated at 20 in Fig. 4 which has the effect of creating a myriad of small venturis.

Preferably coarse sandpaper is used to create fine substantially parallel scratches in a direction parallel to the grooves 17. After this sandpapering action the tops of the mesas 15 are then provided with a thin coat of lacquer.

As best seen in Figs. 1 and 4, located above the mesas 15 is the wire mesh 4 and perforated plate 5 each of which is not essential to the air flow through the platen but which serve the useful function of preventing the heated plastic sheet being sucked into the channels 14, grooves 17 and apertures 19. Also the mesh 4 and plate 5 protect the support plate 3 from abrasion, wear and tear, and the like.

It will be appreciated by those skilled in the art that when an article is placed on the platen 1 and the valves 12 are opened simultaneously, then air is evacuated from the plenum chamber 9 via the conduits 11. In particular, irrespective of the shape of the article or product located on the platen 1, air is able to escape from all around the article via the grooves 17 into the channels 14 and via the channels 14 through the apertures 19 and into the plenum chamber 9. The arrangement is such that a multiplicity of paths for the air are provided and so a quick and uniform evacuation is the result.

The above platen has been tested for its evacuation capability and compared both to those previously used for the ARMACEL process and also those commonly used in normal vacuum forming applications which do not involve the ARMACEL process. Both the speed of evacuation and the quality of the end product (ie the ARMACEL encapsulated article) were markedly better using the platen described in this specification.

It is thought that the improved performance results from many factors, including the fact that the shape, spacing and dimensions of the spacers 7 reduce the volume of the plenum chamber. The spacers 7 being of relatively small size do not obstruct air flow within the plenum chamber, which air flow is thereby improved. In addition, the spacers 7 provide better, more uniform support to the support plate 3 and therefore reduce bending in the support plate 3 when the pressure differential is applied.

Another factor is that this construction maximises and creates uniformity in the grooving of the top surface of the support plate 3. This allows for a uniform and maximum applied pressure differential.

As indicated at the left hand side of Fig. 3 it is possible to locate a venturi 21 in some or all of the conduits 11. The venturi 21 can be located either downstream of the valve 12 as illustrated, or upstream of the valve 12. The venturi 21 preferably leads into a large diameter conduit 22 which is connected to the vacuum tank(s) (not illustrated). It is thought that the venturi(s) 21 act to accelerate the air flow away from the platen 1 and thereby enhance its overall performance.

The foregoing describes only one embodiment of the present invention and modifications, obvious to those skilled in the art, can be made thereto without departing from the scope of the present invention. For example, the array of channels 14 need not be a regular rectangular array as illustrated but could instead be provided by a regular hexagonal array. In addition, although the preferred material for the fabrication and support plate 3 is a timber composite material fabricated from sawdust and glue, other materials such as metals are also suitable. However, an advantage of the timber composite material (as opposed to, say, aluminium) is that it does not conduct heat well, nor does it expand or contract to any significant extent with changes in temperature. Conversely, the metal perforated plate 5 retains heat to some extent and thus the heated plastics film does not loose heat too quickly to adjacent objects. Similarly, the upper surface of the platen need not be perfectly flat but can instead be curved as illustrated in
Fig. 13 of WO 97/09166.

The term "comprising" (and its grammatical variations) as used herein is used in the inclusive sense of "having" or "including" and not in the exclusive sense of "consisting only of".

ASPECTS OF THE INVENTION

The following paragraphs define some aspects of the present invention.

1. A platen for use in product encapsulation and like procedures where gas is to be quickly evacuated, said platen comprising:

a base plate,

at least one gas evacuation conduit each of which communicates through said base plate,

a support plate spaced from said base plate to create a plenum chamber between said base plate and support plate and with which each said gas evacuation conduit communicates,

a first array of channels formed in that surface of said support plate remote from said plenum chamber, those areas of said support plate surface intermediate said channels forming a plurality of mesas, and

a multiplicity of apertures located in said channels and each passing through said support plate to communicate said channels with said plenum chamber.

2. A platen as defined in paragraph 1 wherein said channels intersect one with another and said apertures are located at the intersections between said channels.

3. The platen as defined in paragraph 1 or 2 wherein said mesas have a second array of grooves formed in said support plate surface and leading into said channels.

4. The platen as defined in paragraph 3 wherein said grooves intersect one with another.

5. The platen as defined in paragraph 4 wherein said second array is substantially rectangular.

6. The platen as defined in any one of paragraphs 1-5 wherein said first array is substantially rectangular.

7. The platen as defined in any one of paragraphs 1-5 wherein said first array is substantially hexagonal.

8. The platen as defined in any one of paragraphs 1-7 wherein said support plate is spaced from said base plate by a plurality of spaced apart spacers.

9. The platen as defined in paragraph 8 wherein each said spacer is substantially cylindrical with its longitudinal axis substantially normal to said support plate.

10. The platen as defined in any one of paragraphs 1-9 wherein a fine mesh is supported by said mesas.

11. The platen as defined in paragraph 10 wherein a perforated sheet is supported by said fine mesh.

12. A platen for use in product encapsulation and like procedures where gas is to be quickly evacuated, said platen being substantially as herein described with reference to the drawings.

Dated this 19th day of December 2003

ARMACEL PTY LIMITED
By

FRASER OLD & SOHN
Patent Attorneys for the Applicant

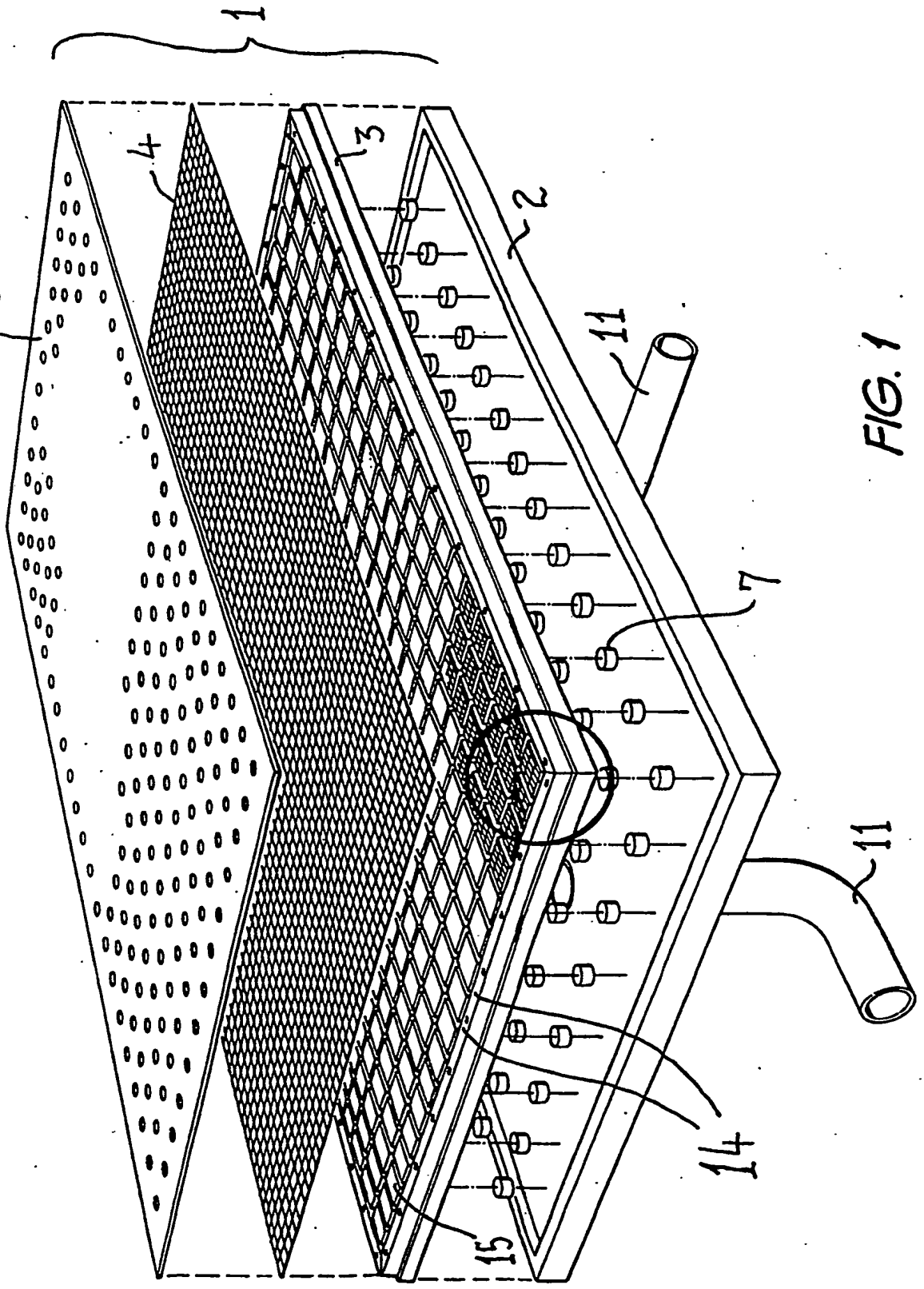

FIG. 1

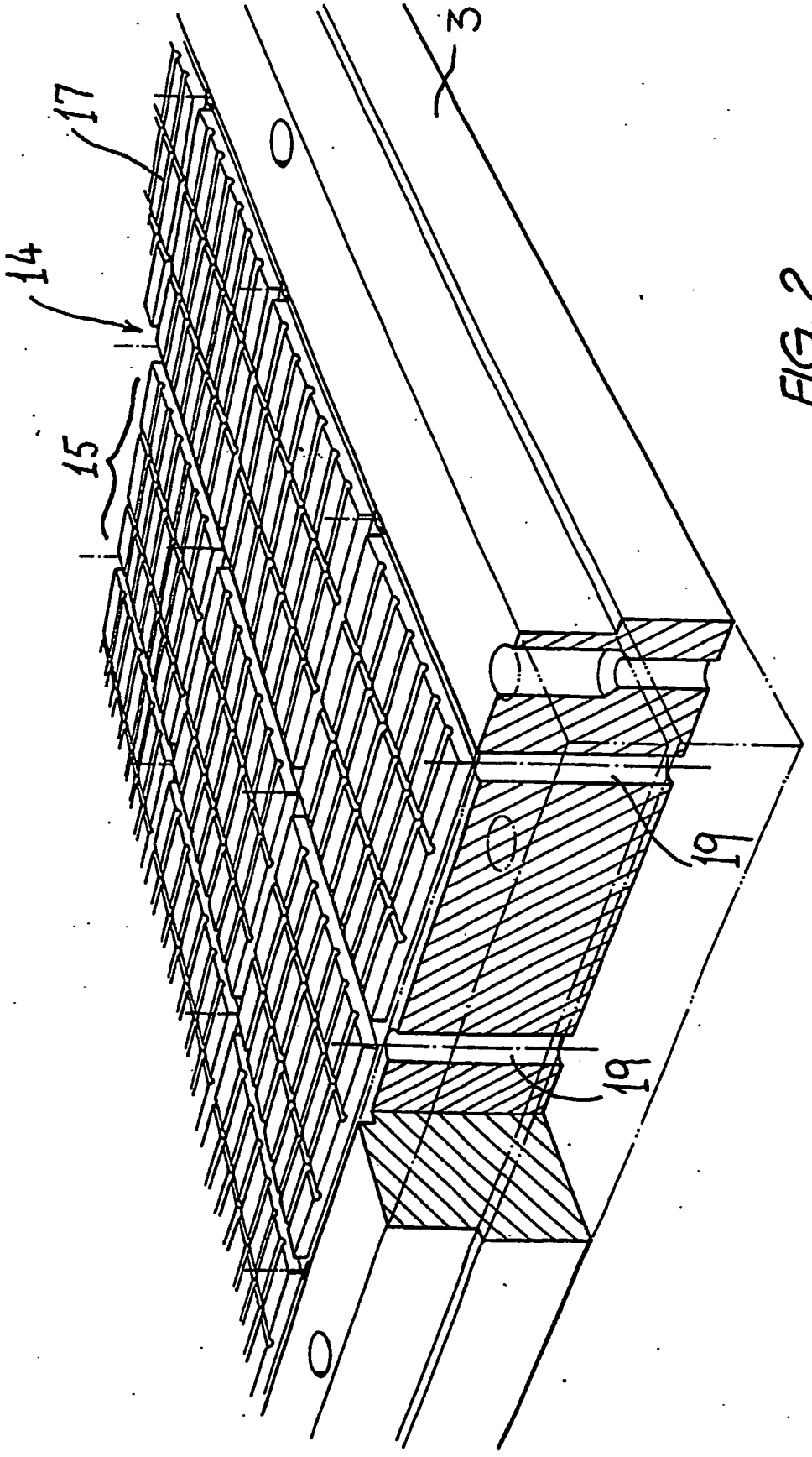

FIG. 2

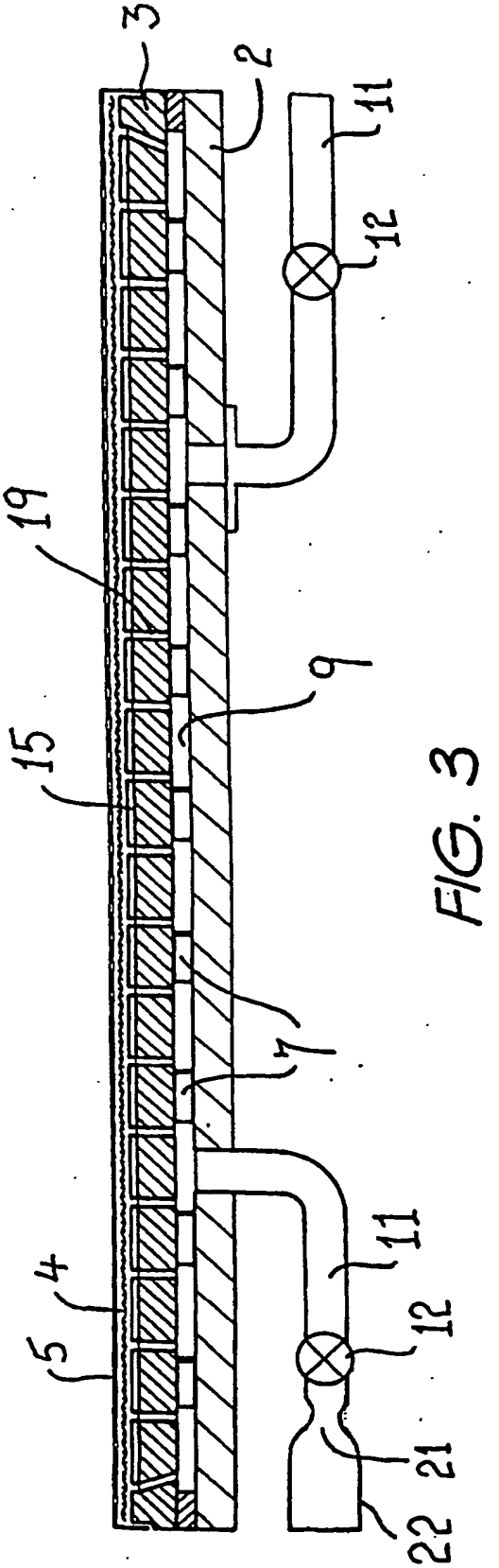

FIG. 3

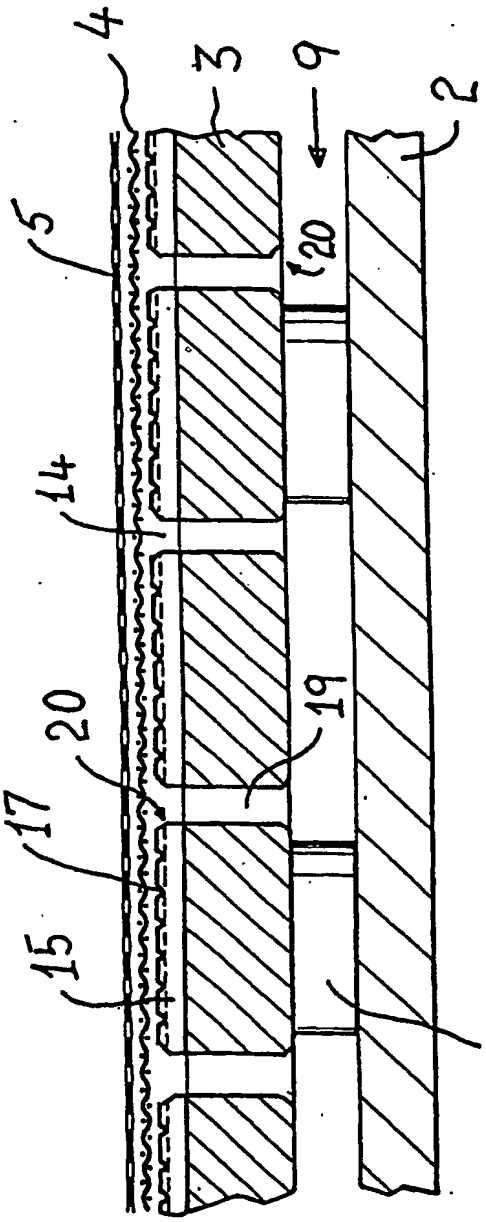

FIG. 4

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